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STATISTICAL TRAINING PROGRAMME FOR AFRICA
(STPA)

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GUIDE SYLLABUS FOR MIDDLE LEVEL PERSONNEL IN STATISTICS

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GUIDE SYLLABUS FOR MIDDLE LEVEL PERSONNEL IN STATISTICS

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Introduction

1. The present guide syllabus for middle level training in statistics is the revision of the guide syllabus presented to the second meeting of Directors of centres participating in the Statistical Training Programme for Africa (STPA). It is made up of two parts respectively devoted to statistical training in English-speaking and French-speaking centres. At the end of each part, an annex gives a list of some textbooks suggested for the use of students. Lecturers may refer to higher level books for the preparation of their courses.

2. The guide syllabus deals with:

a) The training of statistical personnel at certificate level to make them familiar with i) basic statistical concepts; ii) statistical techniques commonly used in data collection and analysis; iii) general problems of data collection, processing and analysis in relation to some specific subject areas; iv) basic economics, and v) the necessary background knowledge in mathematics.

b) The training of statistical personnel at diploma level with higher technical skills than those required of the certificate holder. Such staff are usually expected to play a supervisory role in their respective statistical organizations.

3. In adopting this guide syllabus for use at a centre, it is expected that modification will be made as appropriate to suit local conditions.

English-speaking training centres

4. The guide syllabus for the certificate level is based primarily on that of the Eastern Africa Statistical Training Centre (EASTC), Tanzania. Other syllabuses that were examined include those of the National University of Lesotho, the University of Botswana and Swaziland, and the Institute of Statisticians (United Kingdom).

5. The following topics are considered to constitute a normal programme of nine duration for the certificate level:

Subject	Hours
Economics	64
Mathematics	96
French	64
Statistical Theory and Methods	154
Applied Statistics	190
Total class hours	568

Subject	Hours
Practicals:	
Mathematics	64
Statistical Theory	64
Applied Statistics	64
Total practicals	192
Field Project	120
Total	880

An appropriate remedial course in English may be introduced when considered necessary.

6. The guide syllabus for diploma (middle-level) training in statistics is also based primarily on the corresponding syllabus for the Eastern Africa Statistical Training Centre (EASTC), Tanzania. It is a direct follow-up to the certificate course syllabus. Other syllabuses that were examined include those of the National University of Lesotho, the University of Botswana and Swaziland, the University of Ibadan, Polytechnics in Nigeria and the Institute of Statisticians (United Kingdom).

7. The syllabus covers the following topics for the diploma level:

Subject	Hours
Economics	64
Mathematics	96
Sociology	64
French	64
Commercial Law	64
Statistical Theory and Methods	154
Applied statistics	124
Total class hours	630
Practicals:	
Mathematics	64
Statistical Theory and Methods	64
Applied Statistics	64
Total practicals	192
Field project	120
Total	942

French-speaking training centres

8. The guide syllabus for the training of middle level personnel in French-speaking training centres is the result of the study of programmes available in the Statistics Division of ECA headquarters and of the mission undertaken by a consultant to the Abidjan and Yaoundé centres and to some statistical offices of user countries.

9. The following topics are considered to constitute a normal programme of nine months duration for the agents techniques level (certificate).

Subject	Hours
Economics	40
Economic geography	20
Business accounting	30
Mathematics	64
Computer science	20
French	20
English	32
Statistical theory and methods Applied statistics	316
Field project	140
Total	682

10. The guide syllabus covers, for the adjoints techniques whose training will last two academic years, the following topics:

Subject	Hours		
	Total	First year	Second year
Economics	104	40	64
Economic geography	20	20	-
Business accounting	30	30	-
Mathematics	104	64	40
Computer science	50	20	30
French	20	20	-
English	64	32	32
Sociology	20	-	20
Commercial law	20	20	-
Statistical theory and methods	218	146	72
Applied statistics	210	80	130
Field projects	420	140	280
Total	1,290	612	668

11. For each topic for the agents techniques or adjoints techniques, the number of hours shown above include that of practicals at least in the proportion of one third when necessary.

ENGLISH SPEAKING TRAINING CENTRES

A. CERTIFICATE LEVEL

Entry requirements: Equivalent of "O" level passes in Mathematics, English and two or three other subjects with/without entrance examination.

1. ECONOMICS

I. Microeconomics

Definitions, scarcity and choice
Demand and Supply theories
Production and cost functions
The factors of production and their rewards
Market structures
Location and size of firms: types of business organizations

II. Macroeconomics

Definitions, National Accounts
Income Measurement
Money, Barter, Banks and other financial institutions: their nature and their role

Objectives of government policy
Introduction to money and fiscal policies, IMF, currency exchange rates, special drawing rights, public finance and taxation
International Trade
Balance of Payments
Tariffs and non-tariff barriers

III. Applied Economics

Characteristics of underdevelopment
The least developed of the Developing countries
Rostow's Stages of economic growth
Economic policies (country case studies)
Agricultural and Industrial development (country case studies)
Economic dualism
Balanced growth
Types of Unemployment in Africa
Economic Planning in Africa (with special reference to students countries)
Economic Systems

Principal World Products: Production and exports of basic agricultural products, minerals, other raw materials and energy.
World Traffic: Major land, sea, and air routes; relations between states; important road and railway links in Africa; the Trans-Africa Highway
Economic Groupings within and outside Africa

2. MATHEMATICS

I. The idea of a set, set language and notation, subset, union, intersection, complement, empty set, universal set, number of elements in a set. Venn diagrams, use of symbols to represent numbers and sets. Operation tables, closure, identity and inverse elements

II. Natural numbers, integers, rationals, irrationals. Sets of numbers, prime numbers, factors. Whole numbers in any base. Basic set operations

III. Fundamental operations with numbers, fractions and decimals. Ratios, proportions and variation

Powers and roots.
Use of Tables (squares, square roots, reciprocals).
Indices - their use and the expression of numbers in the form $A10^{x}$ or $B10^{-n}$ where n is an integer
Logarithms
Mensuration
Factorisation of simple expressions including use of factor theorem
Solution of Linear and Quadratic equations

IV. Graphic solution of two simultaneous linear and quadratic equations in two variables

V. Matrix algebra: representation of data by a matrix, addition, subtraction and multiplication of two matrices. Application of matrices to the solution of simultaneous equations in two variables, determinants

VI. Permutations and Combinations

VII. Sequences and Series: Arithmetic Progression; Geometric progression; Harmonic Progression; The sigma notation; Summation of Series; Principle of Mathematical Induction; Series of functions; Power series; Logarithmic and Exponential series

VIII. Inequalities

IX. Binomial Theorem for any index

X. Complex numbers

XI. Trigonometry (trigonometric and hyperbolic functions)

XII. Cartesian Geometry

XIII. Differential and Integral Calculus: Concepts of limits; evaluation of limits; continuous functions; differentials and differentiable functions; ordinary differentiation, derivatives (differential coefficient) of simple functions - exponential, trigonometric etc;
Maxima and Minima; definite and indefinite integrals; integrals of simple functions; Mean value Theorem; Improper Integrals

3. FRENCH

Vocabulary building and grammar learning.

4. STATISTICAL THEORY AND METHODS

I. <u>Descriptive Statistics</u>

Collection of data, populations and samples, tabulation, charts, graphs, frequency distribution.

II. <u>Measures of Central Tendency</u>

(a) Arithmetic Mean, Median, Mode, Geometric mean, Harmonic mean. Comparative study of mean, median, and mode.

(b) Quantiles: eg. percentiles, quartiles and deciles,

III. Measures of Dispersion:
Range, quartile deviation, Mean deviation, Standard deviation, Coefficient of variation

IV. Moments, Skewness and Kurtosis

V. Probability:
(a) Sample spaces, random variables, joint discrete random variables, conditional probability, Expectation, Variance, moment generating functions, covariance
(b) Some standard distributions i.e. binomial, Poisson, Normal and their important properties

VI. Statistical Inference
Elementary idea and use of normal, t and F tables, type I and type II errors; confidence intervals

VII. Linear Association: Regression and Correlation Coefficients:
Fitting a straight line, least square estimation of regression coefficient, Hypothesis testing about the estimates, calculation of coefficient of correlation and its interpretation

VIII. Index numbers and rates
Simple and weighted averages of price relatives; construction of indices (Laspeyres, Paasche) and their limitations; chained indices; crude and standardized rates and their uses.

IX. Time Series:
Secular trend, seasonal and cyclical movements together with random or residual error; elementary methods including moving averages for estimating these components; correcting a time series for seasonality

X. Sampling:
Basic concepts and definitions, sampling and non-sampling errors, random sampling, systematic sampling, stratified sampling, cluster sampling; estimation of the characteristics of a population from a sample; precision and costs.

XI. Standard error of means, proportions, sums and differences

5. APPLIED STATISTICS

I. GENERAL OFFICIAL STATISTICS

a. Discussion on general methods

i) Definition of statistics and its role in modern life (administration, policy formulation, planning, research) and its limitations

ii) Definition of statistical problems and steps in finding a statistical answer. Definitions of some basic statistical problems

iii) Types of statistical data: qualities of good statistical data; types and sources of errors in statistical data: Limitations of statistical data and precautions to be taken in using them

iv) Data collection: methods and problems of data collection, interviewer, postal method etc. Organization of field work, mapping, questionnaire design, carrying out an interview. (Field work: A survey will be organized once a year to give students field experience)

V) Data Processing and analysis. Analysis of data, tabulation, classification, drawing general charts etc. report writing. Use of punch-cards; editing, sorting and tabulation; Data storage, and retrieval
Introduction to general concepts on computers and their place in processing and analysing of data

B. The following concepts will be covered by specific subject areas of application:

i) Sources of data

ii) Objectives and interpretation of the data collected

iii) Methods of compilation and their reliability

iv) Comparability of data with regard to definitions, methods, coverage and quality

v) Their validity with regard to secondary statistics, etc.

II. SPECIFIC APPLICATIONS

The general discussion and coverage will use illustrations from some of the following official statistics:

(a) Agricultural statistics

Coverage of agricultural statistics. Definition of agricultural production and output

Value and volume of output, agricultural prices.

Collection of data; agricultural censuses and surveys, area density, mapping, aerial photography, measuring instruments

(b) Financial statistics

Definition of the public sector: Central and local government, public enterprises. Definition and role of the regular and extraordinary budgets. Public receipts and expenditure, deficit financing, public debt.

Financial institutions: types and uses of data

(c) Demography

Introduction to Demography: The demographic situation in Africa and the World. Sources of demographic data: censuses, surveys, civil records, population registers, other administrative records. Population size, distribution and composition. Age sex composition: correction of age sex data, construction of age pyramid. Mortality and introduction to life tables. Morbidity. Fertility and reproduction, marriage, divorce and widowhood. Population growth: Estimating mid-year population and intercensa population growth. Migration: international and internal.

(d) Industrial Statistics

The nature and uses of industrial statistics;

International Standard Industrial Classification by branch of economic activity; statistical units: the establishment, enterprise, industrial groupings; invertories and their updating; collection and sources of data; index of industrial production; labour productivity.

(e) National accounts

Basic notions; production, intermediate and final products; gross and net output, value added; gross, net, national and domestic values at market prices and factor cost. Use of the gross product. Consumption and accumulation; fixed capital and stocks, finance of production, characteristics of the United Nations system of national accounts (SNA), transactors of the system; standard accounts and tables and the relationships between their elements; definition of aggregates and principal flows.

(f) Price statistics

Nature and role of price statistics - definition, characteristic elements; price movements; legal administration; import, export, factory, retail and wholesale prices; the collection of price statistics; methods, problems, selection of commodities, outlets and frequency of collection; the context and uses of household budget surveys; construction of consumer price indices and their uses.

(g) Labour and employment statistics

Basic concepts and definitions; economically active and inactive populations; demand and supply of labour; indices of employment; unemployment and underemployment; hours of work; wage rates; social security arrangements; industrial accident rates; industrial disputes.

(h) Transport statistics

Nature and use of transport statistics, sources and methods of collection; concepts and definitions in shipping, road, rail and air transport; registered tonnage, loading, unloading, international and domestic trade, transit, traffic performance; ton-kilometres, volume and capacity measurements; passenger journeys; passenger-kilometres; rolling stock, operating ratios; accidents. Censuses of traffic, network and shipping registration. Evaluation of infrastructure. Fixed capital formation.

(i) International Trade Statistics

Concepts, definitions and uses of the statistics: customs, boundaries; systems of trade; countries of origin, provenance, purchase, sale, consumption and destination. Customs declarations; quantity and value measurements: International trade commodity, classification; balance of visible trade; indices of value, unit value, quantity and terms of trade.

(j) Statistical organization and operations including problems of survey organization, processing and publication of statistical data, filing and indexing.

(k) Elements of accounting

The importance of accounts as records of transactions and as aids to efficient management. Recording of transactions: books of original entry, sources of information, documents used; analysis columns; the cash book, petty cash book, records of bank transactions, reconciliation of bank balances, the budget and its maintenance, interpretation of ledger accounts; the trial balance; suspense account. Distinction between nominal and personal accounts; profit and loss accounts. Preparation and interpretation of the balance sheet.

Joint stock companies. Simple treatment to include capital, nominal, called up, paid up, share capital, preference, ordinary, deferred; loan capital, debentures, simple, mortgage, fixed and floating charges; appropriation of profit; interpretation of the balance sheet.

6. PRACTICALS

a) Mathematics
b) Statistical theory
c) Applied statistics

7. FIELD PROJECT

A 3-week field survey on a selected topic to be carried out by students every year. Students will be expected to follow through the stages of planning, design of questionnaire and sample survey analysis.

A N N E X

LIST OF SUGGESTED TEXTBOOKS FOR CERTIFICATE LEVEL

ECONOMICS

A.E. Olone - Economics: its principles and practice in developing countries, Evans 1977

P. Samuelson - Economics, an introductory analysis, McGraw Hill 1967

F.L. Furness - Money and credit in developing Africa, Heinemann Educational books 1975.

A. Seidman - An economic textbook for Africa, Methuen 1972

J. Black and J.F. Bradley - Essential mathematics for economists, Wiley 1973

FRENCH

C. Fisher, J. River, J. Silver & B.K. Waits - A prelude to calculus, Merill 1975

J.P. Lewis - An introduction to mathematics for students of economics, MacMillan student edition 1969

STATISTICS

Hoel - Elementary statistics, Wiley and Sons New York

F.E. Croxton and D.J. Cowden - Applied general statistics, Prentice Hill

Wonnacott and Wonnacott - Introductory statistics for business and economics, Wiley

C. Moser and G. Kalton - Survey methods in social investigations, Heinemann, ELBS 1971

E.K. Hunt - Agricultural statistics for developing countries, Oxford 1969

A short manual on sampling, Vol I, Elements of sample survey theory series F No. 9 Rev 1, United Nations New York

N.R. Sampford - An introduction to sampling theory with applications to agriculture London Oliver and Boyd 1962

B. DIPLOMA (MIDDLE) LEVEL

Entry requirements

(a) Two-year course: same as for the certificate level

(b) One-year course: pass at the one year certificate course or equivalent course.

1. ECONOMICS

I. Microeconomics:

Positive and normative economics, partial and general equilibrium

Types of equilibria, cobweb models

Maximum and minimum prices

Tax and tariff effects on producers and consumers

The Edgeworth box diagram. Pareto optimality, welfare economics and externalities

II. Macroeconomics:

Aggregate demand. IS/LM analysis

Monetary and Fiscal Policy

Inflation, Unemployment

Classical and Keynesian theories

Consumption theories

Exchange Rates

International economics.

III. Applied Economics:

Economics of Underdevelopment:

The terms of trade of the developing countries

Economic Integration

Industrial economics:

Agricultural Economics

Industrialization versus agriculture

Balanced growth:

Rural-Urban migration

Population Growth

Economic Policy

The formulation and evaluation of development plans.

Planning in Capitalist and Socialist countries:

Planning in Africa;
International Economic Relationships (GATT, UNCTAD, ECA, IMF, EEC/ACP Agreement, ECOWAS, COMECON).

2. MATHEMATICS

I. Infinite Series - Convergence
Taylor's Series and Maclaurin's series
II. Polynomials
III. Graphical representation of functions and simple curve tracing
IV. Functions of two and more real variables. Partial differentiation
V. Differential Equations of first order
VI. More integration and differentiation:
differentiation under the integral
double Integration
VII. Introduction to linear algebra: vector spaces
Elementary notion of linear independance; Bases
VIII. Matrices
Rank and Inverse of a matrix
Solution of linear equations
Quadratic forms expressed in matrix notation
IX. Analytic Geometry
X. Interpolation
Linear interpolation
Difference Tables
Lagrange Interpolation formula

3. SOCIOLOGY

Introduction to sociology
Principles and methods of sociology
Culture and social organization
Social structure and social change
Norms, values and socialization
Social differentiation and stratification, social mobility
Social institutions
Sociology and Economics: selected interrelated issues
Social research methods

4. FRENCH

Vocabulary building and grammar learning
Systematic studies of the structure of the language based on economic and topical texts.

5. COMMERCIAL LAW

Legal subjects: notions of body corporate; disabilities; classifications of property, contracts

Trade: trade instruments and tradesmen
commercial activity and competition; commercial enterprises;

Obligations and rights of commercial enterprises: negotiable instruments, means of settlement, trade contracts, bankruptcy, liquidation of goods, legal settlement, dissolution of a company

6. STATISTICAL THEORY AND METHODS

I. Probability

(a) Probability for continuous random variables; joint random variables, marginal probabilities, conditional probabilities, statistical independence, moment and probability generating functions.

(b) Standard Distributions

Binomial, Poisson, normal, geometric, negative binomial hypergeometric, exponential, lognormal, and uniform distributions.
Bivariate normal distribution, Central limit theorem (without proof) and its importance
Relationship of the t, F and chi-squared distributions to the basic distributions and their uses.

II. Statistical Inference

(a) Estimation

Properties of estimators, unbiasedness, minimum variance, efficiency, sufficiency, minimum mean square error. The likelihood function. Properties of maximum likelihood estimators.
Criterion of least squares. Least squares estimators and their properties in the linear model.

(b) Hypothesis Testing

Neyman - Pearson lemma (without proof). Types of error. Power and operating characteristic curves. Simple and composite hypotheses. Likelihood ratio tests. Testing for goodness of fit.

III. Sampling:

Estimation of total, mean, proportion and their standard errors
Two-stage sampling
Simple random sampling systematic sampling, sampling with unequal probability, stratification, ratio and regression estimates, standard error, coefficient of variation.

IV. Regression: Analysis

Multiple linear regression, multiple correlation, partial correlation, linearisation of non-linear curves. rank correlation

V. Analysis of Variance:

Analysis of variance for one-way classification (Model I and Model II) two-factor experiments (including replication), explanation of interaction by diagram, calculation of treatment effects and their standard errors, estimation of variance components.

VI. Two-way contingency tables tests of independence, goodness of fit.

VII. Time series analysis:

Components of Time series
Trend, oscillations including seasonal variation and cyclical movement, random (residual variation)
Calculation of the various components: Finding and adjusting for seasonal variation, etc.

VIII. Linear programming:

Introduction, Transportation problem
Simplex method.

7. APPLIED STATISTICS

The course has the same objectives as the Certificate Level syllabus. Some of the topics covered in the Certificate Level are expanded to allow for greater details and, in addition, new topics are included.

A. Expanded Certificate Level Topics:

(a) Organization of Statistical survey: with detailed discussion on administrative problems, planning and organization, selection and training of enumerators, field work, scheduling and control etc.

(b) Demography: extension of analytical methods such as the construction of life tables, population projections etc. Stationary and stable population, population policy and programmes.

(c) Electronic Data Processing: Development of aids to computing; computer characteristics; input/output, and central processing unit; definitions of data, records and data fields, data bases and data banks, input/output media and operations; computer applications, organization; programming, including flow charts and one high-level language (COBOL or FORTRAN). Comparative studies of available softwares and computer languages.

B. Additional Topics

(a) Education Statistics
(b) Housing Statistics
(c) Balance of Payments Statistics
(d) Financial Statistics
(e) National Income Accounting
(f) Statistics of Planning
(g) Medical Statistics
(h) Research methods (application of sample survey, experimental design and various techniques in such areas as Agriculture, Medicine, Market and opinion research etc.)

C. Organization and Supervision of Statistical Work

(a) Notions of office organization, centralization and decentralization of service
(b) Administrative functions of a supervisor
(c) Responsibility of a supervisor

(d) Qualities of a supervisor i.e. administrative, planning, regulation of work, control over various operations, training of primary field staff, use of progress charts and maintenance charts and performance graph of workers

8. PRACTICALS

a) Mathematics

b) Statistical theory and methods

c) Applied statistics

9. FIELD PROJECT

Generally a 3-week field survey on a selected topic is carried out by the students. Students will be expected to follow through the stages of planning, design of questionnaire and sample survey analysis.

Where appropriate the project may be based on examination of available data in the public or private sector. In such situation, in addition to the analysis of the data, students will be expected to comment on the methods by which the data have been collected.

A N N E X

LIST OF SUGGESTED TEXTBOOKS FOR DIPLOMA LEVEL

ECONOMICS

Henderson and Quandt - Microeconomic theory, MacGraw Hill 1975

P. Samuelson - Economics, an introductory analysis, McGraw Hill 1967

A.R. Prest - Public Finance in developing countries, Weidenfeld and Nicholson 1975

I. Adelman - Theories of economic growth and development, Stanford University Press 1961

P.T. Bauer - Economic analysis and policy in under-developed countries, Duke University Press

H. Myint - The economics of the developing countries, Hutchinson University library 1967

J. Black and J.F. Bradley - Essential mathematics for economists, Wiley 1973

SOCIOLOGY

J.E. Goldthorpe - The sociology of the third world, disparity and involment, Cambridge University Press 1975

J.E. Goldthorpe - An introduction to sociology, Cambridge University Press

COMPUTER SCIENCE

D. McCracken - A guide to FORTRAN IV programming, Wiley 1972

D. McCracken - A guide to COBOL programming, Wiley 1972

ACCOUNTING

B.G. Vickery - Book-keeping and accounting, Cassell London

COMMERCIAL LAW

J.A. Slater - Pitman's commercial law, John Nevin London

FRENCH

Beaumont - Le roman de Renard, Textes français faciles, Hachette

A French reference grammar, Oxford University Press

MATHEMATICS

G. Freilich and F. Greenleaf - Calculus: a short course with applications, Freeman 1976

R.G.D. Allan - Mathematical analysis for economists, McMillan 1960

R.O. Fergusson and L.F. Sargent - Linear programming: fundamentals and applications, McGraw Hill 1958

STATISTICS

Hoel - Introduction to mathematical statistics, Wiley and Sons New York

F.E. Croxton and D.J. Cowden - Applied general statistics, Prentice Hill

Mendenhall - Introduction to probability and statistics, Duxbury Press

A. Stuart - Basic ideas of scientific sampling, Charles Griffin and Co., 1962

C. Moser and C. Kalton - Survey methods in social investigations, Heinemann, ELBS 1971

A short Manual on sampling, Vol I, Elements of sample survey theory, Series F No. 9 Rev 1, United Nations New York

W.G. Cochran - Sampling techniques, Wiley 1977

E.K. Hunt - Agricultural statistics for developing countries, Oxford 1969

W.G. Barclay - Techniques of population analysis, Wiley 1958

R. Pressat - Demographic analysis, Aldine and Atherton Chicago 1972

T.P. Hill - The measurement of real product, OECD Paris

M.R. Sampford - An introduction to sampling theory with applications to agriculture, London Oliver and Boyd 1962

FRENCH-SPEAKING TRAINING CENTRES

A. AGENTS TECHNIQUES LEVEL

Entry requirements:

Candidates should have had five years of schooling in high schools or colleges (approximately "O" level) with entrance competition.

1. ECONOMICS

Fundamental notions of economic thought: needs, goods, values
Economic agents and transactions
Production
Consumption
Money and credit
Markets and prices
Government economic interventions. objectives and means
Over-all economic activity
Outlines of international economic issues
Outlines of the analysis of under-development and the theorical bases of development policy

2. ECONOMIC GEOGRAPHY

Notions of physical geography. African economic geography
Major economic groups and their economy, production, marketing. Major products

3. BUSINESS ACCOUNTING

General notions. Accounting mechanisms. Accounting obligations.
Accounting systems. OCAM accounting plan. Accounting analysis, balance sheet, operating accounts

4. MATHEMATICS

1. Sets, subsets, operations on subsets, Cartesian product of two sets
2. Binary relations; relation of order; relation of equivalence; classes of equivalence
3. Laws of internal and external composition; structures of group, ring, and field
4. Polynomials
5. Notions of functions
   Numerical functions. set of definition, parity, periodicity, variations; representation on an orthonormal base; co-ordinates transformation; Maxima and minima of functions
6. Notions of continuity and limit
7. Study and graphic presentation of functions:

$$x \longmapsto ax+b$$

$$x \longmapsto |ax+b|$$

$$x \longmapsto ax^2+bx+c$$

$$x \longmapsto \frac{1}{x}$$

and $$x \longmapsto \frac{ax+b}{cx+d}$$

8. Notions of trigonometry
9. Notions of sequences and series arithmetic and geometric progressions
   Use of symbols Σ and Π
10. Numerical computation: practice in rapid computation, the four operations, square roots, averages, rates; errors and uncertainities powers and roots computations compound interests and annuities. Linear interpolation. Decimal logarithms, use of tables
11. Linear algebra, notions of vector space and of linear independence, bases: linear applications and matrix of a linear application
12. Notions of combinatory analysis. combinations, arrangements and permutations.

5. COMPUTER SCIENCE

Generalities on the use of machines in office-work. Definition and principles of computers. Central unit, central memory, arithmetic and logical units, Input and output units.
Instructions and programming
Introduction to the study of FORTRAN and use of available packages

6. FRENCH

Study of economic, social or topical texts to increase vocabulary
Written and oral appreciation of and commentary on texts, reports, summaries
Introduction to administrative drafting. Correspondence, vocabulary, style

7. ENGLISH

Study of texts to teach idiomatic terms and expressions
Translation of economic and statistical texts

5. STATISTICAL THEORY AND METHODS

1. Probability:

Notions of experiments and events, axioms of probabilities, conditional probabilities. Theorem of Bayes.
Notions of random variable, moments. Distribution function. Probability law.

2. Descriptive statistics:

Definitions, nature and subjects of statistics.
Statistical sets and units; descriptive and numerical characteristics, modalities; discrete and continuous variables.
Statistical distributions with one characteristic, statistical tables, number and frequencies, cumulative numbers and frequencies.
Graphic presentations, integral and differential diagram for a discrete variable, for a continuous variable, bar charts, pie charts, figurative charts
Characteristics of central trend: arithmetic, geometric and harmonic averages, mode, median.
Characteristics of dispersion: range, average absolute deviation, variance, standard deviation, coefficient of variation, quantiles, moments.
Statistical distributions with two parameters: marginal and conditional distributions, linear correlation coefficient; graphic presentations.
Adjustments: use of logarithmic papers, etc., adjustment methods

3. Time series:

Definitions, component of a time series: trend, cycles, seasonal variations, random error.
Elementary methods for correcting a time series for seasonality, including moving averages.

4. Index numbers:

Elementary indices, synthetic indices, weights. Indices of Laspeyres and Paasche. Chained indices.

5. Statistical organization

Structure of a statistical office distribution of tasks. Geographical decentralization, decentralization in Ministries. Organization of surveys and censuses. Connections with the computer centre. Connections with international organizations.

6. Data collection and processing

Indirect data collection from other administrative sources; direct data collection by censuses, sample surveys (sampling frames, sampling units, drawing of samples).
Continuous, periodic surveys. Drafting of questionnaires. Training of interviewers. Planning of the field work.
Coding, checking, filing, use of codes and nomenclatures. Data entry. Files and identifiers.

C. APPLIED STATISTICS

1. Agricultural statistics:

Scope of agricultural statistics. Basic statistics and concepts. Current statistics, areas, yields, productions, prices. Data collection, difficulties, censuses, surveys, density squares, measuring instruments.

2. Financial statistics:

Definition of public sector: central and local government, public enterprises. Definition and role of the regular and extraordinary budgets. Public receipts and expenditure, deficit financing, public debt. Financial institutions: types and uses of data.

3. Demography:

Definition and purpose of demography. World population. Types of the population, its distribution, categories of population. Natural movement, nationality, birth rates, fertility, mortality, mortality rates, stillbirths, infant mortality. Natural growth rate. Vital statistics. Migratory movements. Difficulties of demographic observation in Africa: censuses, surveys, organization, controls, training of interviewers, drafting of questionnaires.

4. Industrial statistics:

Introduction, scope of industrial statistics. Clarification of branches of economic activity. Statistical units: establishment, enterprise, group, unit surveyed. Files. Data collection methods. Categories of data to be collected. Industrial production index, weights.

5. National accounts:

Concepts and definitions of national accounts. Branches of activity. Production, factors of production. Notions of intermediate goods, final goods, value added, gross production, net production, national and domestic productions, evaluation in market prices and factor costs, evaluation in current and constant prices. Transactors and transaction units. Operating accounts. Principal aggregates. Supply and disposition of goods and services, general economic view table.

6. Price statistics:

Definitions, price characteristics. Price observation, methods, types of products, purchases and weights, places and frequency of collection. Use of price data. Indices. Determination of weights.

7. Labour statistics:

Economically active population, definition and distribution. Idle population: composition. Nomenclatures. Employment, supply and demand, number of workers. Employment index, sources of information and surveys. Unemployment, observation. Wages and wages benefits.

8. Transport statistics:

Nature of transport statistics, methods, sources of data. Filling and utilization coefficients. Road transport, infrastructure, vehicles files, traffic surveys. Rail transport, rolling stock, passenger traffic, tariffs. River navigation, traffic. Evaluation of infrastructure. Fixed capital formation.

9. External trade:

Definition, nature of external trade statistics. Basic concepts. Customs declarations: quantities and values. Nomenclatures. Methods of compiling external trade statistics. Tabulation and interpretation of results. External trade indices.

10. FIELD PROJECT

Internship

Duration: four weeks starting in May

The agents techniques students will be assigned to statistical offices or will participate in field activities organized by the permanent professors of the centre.

Their work will be assessed by persons responsible for the internship. The students are to prepare a report, the quality of which will be taken into account in awarding diplomas.

ANNEX

LIST OF SUGGESTED TEXTBOOKS
FOR AGENTS TECHNIQUES (Certificate)

ECONOMICS

M. Marchesnay - Economie générale, Tome 1 classes de lère G et Terminale H, Istra
J. Rinaudo et R. Coste - Initiation aux Sciences économiques - Tome 1 et 2, Nathan
J. M. Albertini - Les rouages de l'économie nationale, Editions ouvrières
P. Salles - Initiation économique, Tome 1 classes de lère G et Terminale H, Istra
J. M. Albertini - Les mécanismes du sous-développement - Editions ouvrières

COMPUTER SCIENCE

P. Mirbel - Principes des ordinateurs - Dunod
Dreyfus - FORTRAN IV - Dunod
B. Drieux et A.L. Lisu - le langage BASIC, P.U.F
Scheid - Introduction à l'informatique, série Schaum édition française, McGraw Hill

BUSINESS ACCOUNTING

B. Jadaud et S. Passeron - Comptabilité privée, mémentos Dalloz
Rossignol, Prast, Breuil - Plan comptable OCAM, méthodes et techniques comptables, Foucher

FRENCH

P. Salles - Explication d'un texte économique - Dunod
G. Matore - Dictionnaire du vocabulaire essentiel
F. Richardeau - Les secrets de la communication, CEPL 1975

ENGLISH

L'Anglais économique et commercial 10-18, Union générale d'éditions Paris
M. Montgomery, J.O. Bisong and R.E. Morakynio - Effective
English, students book 1, Evans

MATHEMATICS

C. Gauthier, D. Geril, C Thiercé et A. Wamsfel - Mathématiques 2^{e}, Hachette
Collection P. Vissio - Mathématiques classes de 2^{e} CDT, Delagrave
Collection P. Vissio - Mathématiques classes de lère CDT, Delagrave

STATISTICS

Cluzel et Vissio - Mathématique et statistique, Delagrave
Lipschutz - Probabilité, série Schaum édition française, McGraw Hill
Riche - Probabilités et statistique, terminales C, D, E, Hatier
C. Labrousse - Exercices corrigés de statistique, tome 1, Dunod
Initiation à la comptabilité nationale, Ministère de la Coopération

B. ADJOINTS TECHNIQUES FIRST YEAR

Entry requirements:

Candidates should have attended seven years in high schools or colleges (approximately "O" level) or hold the agent technique diploma with at least two years of post-qualification experience with entrance competition.

1. ECONOMICS

Definition and purpose of economics, evolution, methods and instruments of economic analysis.

Generalities: economic circulation, instruments, agents, operations, sectors of activity. The two major contemporary economic systems.

Production: enterprises, types, concentration, integration, production factors and costs, supply curves. National production.

Consumption: consumer behaviour, consumption and savings, diseconomies, propensity to consume, the function of consumption .

Trade and the determination of prices. Various types of markets, supply and demand. Price formation, elasticity, competition, monopoly

Currency and credit: functions, current forms. Money supply, quasi-money, conditions of issue, speed of circulation, types of credit. Monetary policy; IMF

Introduction to international trade: its role, balance of payments, problem of exchange. National and international policies.

Introduction and role of country groupings and international bodies.

2. ECONOMIC GEOGRAPHY

Major world commodities: production, export

Agricultural and industrial production: groundnuts, wheat, cocoa, coffee, cotton, wood sugar, oils, ...

Ores and raw materials: bauxite, cooper, tin, magnesium, zinc, iron, ...

Energy products: coal, electricity, natural gas, petroleum.

World international traffic: major sea routes, air routes; inter-country links: roads and railways.

Economic groupings: outside Africa, in Africa

3. BUSINESS ACCOUNTING

Business as an economic agent: resources, expenditures, external flows, internal flows, operating cycle.

Accounts: definitions, registration regulations, double entry.

Accounting plan: introduction, major categories and accounts. OCAM plan: situation and movement accounts.

Accounting operations at the end of the financial year.

Operating account: preparation, profits and losses, results.

Balance sheet.

Management analysis: ratios, costs, cost prices, fixed charges, variables.

4. MATHEMATICS

1. Sets, subsets, subsets operations, Cartesian product of two sets. Binary relations: relations of equivalence, relations of order.
   Internal and external laws of composition
2. Functions, definitions and generalities
3. Algebraic structures: group, ring, field
4. Set of natural whole numbers
   set of relative whole numbers, set of rational numbers; set of real numbers
5. Equations and inequalities (review): changes of unknowns, graphic presentation
6. Systems of equations of first degree
7. Second degree equations and inequalities; examples of irrational equations and inequalities
8. Numerical functions: generalities, parity, periodicity, variations
   Representation on an orthonormal base
9. Limits and continuity
10. Derivation: Definition of a derivative, calculation of derivatives, notion of differentials, derivative of a function, Rolle's theorem, Taylor and Maclaurin formulae
    Applications of derivation: Variations of functions, examples of studies of functions
11. Integration: Integral of Riemann; integral calculus: primitives, integration by parts

12. Logarithmic functions: definition of Neperian logarithm. Logarithms with base a, base change, calculations.

13. Exponential functions: exponential functions with base e, with any base.

14. Numerical computation: use of symbols Σ and Π. Practice in rapid computation, computation tables. Progressions. Errors and uncertainties: definitions, theorems. Use of value tables. Linear interpolation .

5. COMMERCIAL LAW

General introduction

Legal subjects: notion of body corporate. Disabilities, the law and one's rights, classifications of property, contracts

Trade: trade instruments and tradesmen. Commercial activity and competition; commercial enterprises; legal categories; trade register businesses

Obligations and rights of commercial enterprises: negotiable instruments, means of settlement, trade contracts. Bankruptcy, liquidation of goods, legal settlement, dissolution of a company.

6. COMPUTER SCIENCE

This course is aimed at providing a common language and fostering dialogue with computer specialists.

Generalities: data processing, definitions: data, logical record, physical record, files, data bank

Data problems: format, entry

Errors and verification, machine processing, confidentiality

Data carriers

Review of numeration systems: binary numbers

Hard ware: the computer: central memory, logical unit, arithmetic unit

Input, output and storage peripherals

Files: characteristics, structures, organization and addressing

Development of computer generations

Operating modes: batch processing, real time, teleprocessing

Software: Computer management system, Programming languages, objective, instruction, high-level languages, machine languages, assembler. Organizational charts, programming

Controls in a data processing system at the time of information input, accounting controls, tables, verification of results

Organization of a data processing centre (DPC): various units, functions

Visit of a DPC

7. FRENCH

Comprehension of topical economic, social or topical texts

Note-taking, writing of summaries and comments. Text analysis, titling. Vocabulary building. Expression. Administrative drafting, style, reports, instructions. Increased readability.

Practice in oral presentations of selected topics.

8. ENGLISH

Study of texts to learn idiomatic terms and expressions.

Translation of economic, social, or topical texts.

Vocabulary building

9. STATISTICAL THEORY AND METHODS

1. Statistical organization: geographical centralization and decentralization, distributive statistics.
   Internal structure of a statistical office and distribution of tasks: filing, confidential information, connection with the computer centre.

2. Collection of information:
   Indirect collection of information from administrative or quasi-public relationship with the statistical office sources
   Direct collection: exhaustive or partial, continuing or periodic.
   Determination of objectives, means. Source documents. Determination of the population to be surveyed and choice of statistical units.
   Choice and training of enumerators. Questionnaire drafting.
   Follow-up to and checking of the field work.

Data processing: Filing, codes, nomenclature; data input, manual and automatic processing. Files and identifiers, significant and non-significant

3. Descriptive statistics:

Generalities, definitions, origin and development of statistics.

Statistical sets and units, characteristics, modalities, discrete variables, continuous variables.

Classification of data. Review of basic concepts

Counting modes, notion of level or stocks, notion of flow.

Statistical distribution with one parameter. Statistical tables: numbers, frequencies, cumulative numbers and frequencies, classes, limits and centres of classes

Graphic presentation of functions: Bar and step charts; histograms and cumulative frequency curves

Pictograms and other charts

Central trend characteristics: Yule regulations, mode, median, averages

Dispersion parameters: range, absolute average deviation, variance, standard deviation, quantiles, interquartile range, relative interquartile coefficient, variation coefficient

Other characteristics: form, concentration, concentration index, medial

Statistical distribution with two parameters: notion of correlation. Statistical tables: marginal or conditional distribution

Graphs: scatter diagrams, regression curves

Linear regression: introduction, analytical determination, regression line (Mayer), least squares method, progressive averages, moving averages

4. Time series:

Definition, graphic presentation, components

Study of a time series: trend, seasonal coefficients, seasonal adjustment

5. Indices:

Elementary indices: definition, properties

Synthetic indices: introduction, construction

Weighting coefficients

Laspeyre's, Paasche's indices

Chained indices

Practical problems: price indices, quantity indices, choice and calculation of weights.

6. Probability:

Combinatorial analysis: combinations, arrangements, permutations

Binomial formula, Pascal's triangle

Notions of probability: simple events, composite events; independent, exclusive, equiprobable events; theorem of Bayes

Probability drawings

Random variables: definition, distribution function, probability law, probability densité function, moments

Inequality of Byename - Tchebycheff, application to the law of large numbers

Relationships between descriptive statistics and probability

Theoretical distributions: Bernoulli, discrete uniform binomial, Poisson, normal.

10. APPLIED STATISTICS

1. Demography:

General: definitions, purpose of demography, situation of the world population and the African population

Types of the population: Categories: de jure or resident population, actual population, institutional population, concentrated population, sparsely settled population, urban population, rural population

Structure: according to sex, age, the age pyramid, marital status, individual activities, economic sector, level of instruction, nationality, religion, ethnic group

Natural movement: generalities, births, deaths; vital statistics: registration, principle of mobile civil registration

Impact of migratory movements: international migrations, internal migrations, seasonal migrations, definitive migrations, border migrations

Demographic analysis

Rates: population density, birth rate, fertility rate, mortality quotient and rate, stillbirths, infant mortality

Notions of mortality tables, life expectancy
Lexis diagram
Natural growth rate, demographic projections
Difficulties in demographic studies, methods used: improvement of administrative censuses: censuses and surveys of statistical offices, approaches, personnel training, controls

2. Labour statistics:

Basic concepts: individual and collective activity, situation in the profession, major nomenclatures
Working population: definition, distribution, activity rate
Idle population. distribution
Study of employment: sources of data, working life, job supply and demand, number of workers, employment index, length of work, activity index
Specific surveys
Underemployment, unemployment
Wages: components, rates wage earners, distribution, labour costs
Revenues from social benefits: family allowances, work-related sickness and accident payments retirement pensions.

3. Price statistics:

Movements of specific and general prices
Role of price statistics: definitions, characteristics of price, legal system: different stages of pricing: import, ex-works wholesale, retail
Price observation: methods used according to type of product, purchasing and weighing, difficulties, outlets and frequency of collection
Use of data: chronological indices, base period, weighing indices for geographical comparison
Scope and use of price indices: index adjustments, adjustment coefficients,
Family budget surveys: objectives, implementation, utilization

II. FIELD PROJECT

The internship is planned for students entering the second year. Its purpose is to introduce students to problems of statistical production.

Duration: four weeks
Date: 1 to 30 September

C. ADJOINTS TECHNIQUES SECOND YEAR

1. ECONOMICS

Distribution and use of the national revenue
Growth and economic equilibria
Random fluctuations and policies of stabilization
Economics of development: definitions and characteristics of underdevelopment, indicators. Internal and external constraints to economic development. Interventions for harmonized development
Introduction to planning, definition, various types, nature, stages, general planning framework. Control of implementation of the Plan. Planning in capitalist countries. Planning in Socialist countries.

2. SOCIOLOGY

Introduction to sociology
Principles and methods of sociology
Culture and social organization
Social structure and social change
Norms, values and socialization
Social differentiation and stratification, social mobility
Social institutions
Sociology and Economics: selected interrelated issues
Social research methods

3. MATHEMATICS

1. Review of first year courses
2. Integral calculus: primitives, integration by parts; integration by change of variables. Outline study of functions defined by integrals. Convergence.
3. Numerical sequences and series, usual criteria of convergence
4. Trigonometric and hyperbolic functions
5. Function of two variables, continuity derivation, differentiation; maxima and minima
6. Double integration, definition and calculation, change of variables
7. Differential equations of first order
8. Principles of numeration systems. Notions of base; systems with bases 10, 2, 8, 16; system changes

9. Introduction to linear algebra: vector spaces, linear independance, bases; linear applications; matrix of a linear application; determinant; inversion of a regular and linear matrix; change of bases.

4. COMPUTER SCIENCE

Review of first year course
Logic and optimal design of programmation
Thorough study of FORTRAN
Comparative studies of available softwares and machine languages
Concrete application: students are divided into a group of 2 or 3 and write the programme which will enable the machine processing of the example being studied.

5. ENGLISH

Study of texts to learn idiomatic terms and expressions
Translation of economic, social or topical texts
Vocabulary building

6. STATISTICAL THEORY AND METHODS

1. Probability:
   Review of first year courses
   Joint random variables, marginal and conditional distributions, correlation, independence.
   Usual probability laws: binomial, hypergeometric, negative binomial, normal laws, derived laws from normal laws (Chi-squared, student, Fisher-Snedecor)
   Use of tables
2. Introduction to statistical inference
   Adjustment of a theoretical law to an observed series, problems and methods; use of logarithmic paper, etc....
   Sampling distribution. Central limit theorem (without proof)
   Point estimation and estimation by confidence interval
   Tests of hypotheses
3. Sampling:
   Basic concepts: sampling units, sampling frames; random sampling by purposive selection

Sampling methods

Simple random sampling, different drawing methods

Multi-stage sampling. Stratification

Use of random number tables

Estimation of the characteristics of a population on the basis of a sample: mean, proportion, total, ratio, variance

Accuracy and costs

7. APPLIED STATISTICS

1. National accounts:

Generalities: definition, nature, background

Basic notions: production, intermediate goods, final goods; value added, global production and products, notions of gross and net, national and domestic; evaluation at market prices and factor costs; evaluation at current and constant prices. Use of the global product; consumption and capital formation, fixed capital and stocks. Production financing characteristics of a national accounting system. Transactors and transactor units. Types of economic activity and transaction accounts. Standard accounts, relationships between elements, definition of aggregates, definition of principal flows. General economic view table. Interindustry trade table. UN National accounting system.

2. External trade:

Definition: nature of external trade statistics

Concepts: Customs areas, country of origin, last country of export, consumption, destination, sales, categories of traffic, general trade, special trade

Customs declarations: values, weights, statistical quantities

Nomenclatures: products, countries, international accounting

Means of preparing external trade statistics: interpretation of results, coverage rates, balance of trade

Indices: volume index, total values, unit value

Terms of trade

3. Industrial statistics:

Introduction: Nature of industrial statistics

Scope - International Standard Industrial Classification of all Economic Activities

Statistical units: establishment, enterprise, groups

Files and updating of files

Data collection and sources of information

Data to be collected

Industrial production index, labour productivity

4. Transport statistics:

Nature of transport statistics, methods, data sources, technical statistics, economic statistics

Traffic analysis: travellers, goods, service, loading, unloading, transit

Filling coefficients, utilization coefficients

Air transport, domestic traffic, international traffic

Maritime transport, long-haul vessels, coastal vessels

River navigation, local traffic, transit, exports, imports

Rail transport, passenger traffic, goods, rolling stock, stationary equipment

Road transport: vehicles, files and new registrations, consumption

Surveys on road traffic

Evaluation of infrastructure, fixed capital formation

5. Agricultural statistics:

The particularities of agricultural production, the calendar

Scope of agricultural statistics, definitions and concepts: agricultural population, farming, land development cultivated surfaces, livestock, means of production

Current statistics: areas, yield, production, prices

Collection of information: censuses, sample surveys, density squares, maps, aerial photographs, measuring instruments, controls

Difficulties of agricultural surveys

6. Financial statistics:

Review of national accounts: economic co-operation, transactors

Definition of public sector: central and local government, Public bodies, public enterprises; extrabudgetary accounts

General government budget: functioning, equipment; budgetary regulations.

Public expenditures: definitions, classifications

Public resources: taxes, treasury

Financial institutions: the Central Bank, deposit and development banks, postal cheques, saving banks

Data to be collected for each of these institutions

8. FIELD PROJECT

End of studies internship

Duration: 2 months

Date: from April

At the end of the internship, each student must submit a report on the organization and functions of the host department, work done and difficulties encountered.

The internship report, and the attendance and behaviour of students will be assigned a grade which will be taken into account in awarding the school's diploma.

ANNEX

LIST OF SUGGESTED TEXTBOOKS
FOR ADJOINTS TECHNIQUES (Diploma)

ECONOMICS

J. Rinaudo et R. Coste - Initiation aux sciences économiques, tomes 1 et 2, Nathan
J.M. Albertini - Les rouages de l'économie nationale, Editions ouvrières
P. Salles - Initiation économique et sociale, tomes 1 et 2, Dunod
M. Marchesnay - Economie générale, tome 1 classes de lère G et Terminale H, Istra
Salvatore - Microéconomie, série Schaum édition française, McGraw Hill
Diulio - Macroéconomie, série Schaum édition française, McGraw Hill
B. Bernier et Y. Simon - Macroéconomie tomes 1 et 2, Dunod
J.M. Albertini - Les mécanismes du sous-développement, Editions ouvrières
Watterston - La planification du développement, Dunod

SOCIOLOGY

A. Cuvillier - Introduction à la sociologie, Armand Colin
J.H. Fichter - Sociologie, Editions universitaires
J. Ziegler - Sociologie de la nouvelle Afrique, Gallimard

COMPUTER SCIENCE

P. Mirbel - Principes des ordinateurs, Dunod
Scheid - Introduction à l'informatique, série Schaum édition française, McGraw Hill
B. Drieux et A.L. Lisu - Le langage BASIC, P.U.F.
Dreyfus - FORTRAN IV, Dunod
R. Reix - L'informatique appliquée à la comptabilité et à la gestion, Foucher

BUSINESS ACCOUNTING

B. Jadaud et S. Passeron - Comptabilité privée, mémentos Dalloz
Rossignol, Prost, Breuil - Plan comptable CCAM, méthodes et techniques comptables, Foucher

COMMERCIAL LAW

Grillon et Tremeau - Droit civil, lycées techniques classes de lère, Foucher
R. Houin et M. Pedamon - Droit commercial, précis Dalloz
R. Rodiere et B. Oppetit - Droit commercial, précis Dalloz

FRENCH

P. Salles - Explication d'un texte économique, Dunod
G. Matore - Dictionnaire du vocabulaire essentiel
F. Richardeau - Les secrets de la communication, CEPL 1975

ENGLISH

L'Anglais économique et commercial 10-18, Union générale d'éditions Paris
M. Montgomery, J.O. Bisong and R.E. Morakynio - Effective
English, students book 1, Evans

MATHEMATICS

Collection Queysanne, Revuz - Mathematiques terminales CDE, tomes 1 et 2, Fernand Nathan
Mathématiques terminales C et D, Editions Gamma
Monge, Egoroff, Hautcoeur, Tardieu - Mathématiques terminale D, Belin
M. Gourion et Lixi - Exercices et problèmes résolus, terminales C et E
A. Hocquenghiem, P. Jaffard et R. Chenon - Mathématiques tome 1, Masson et Cie
Lipschutz - Algèbre linéaire, série Schaum édition française McGraw Hill
E. Berrebi - Exercices corrigés de mathématique, Dunod

STATISTICS

G. Hansel et E. Berrebi - Eléments de probabilité et de statistique tome 1, Dunod
Lipschutz - Probabilité, série Schaum édition française, McGraw Hill
J. Le Caillon et C. Labrousse - Statistique descriptive, Cujas
P. Face - Cours de statistique, Licet
B. Grais - Statistique descriptive, tomes 1, 2 et 3, Dunod
J. Fourastié - Les indices statistiques, Dunod
H. Guitton - Statistique, introduction destinée aux étudiants du 1er cycle de l'enseignement supérieur, Dalloz
C. Labrousse - Exercices corrigés de statistique, Tomes 1, 2 et 3, Dunod